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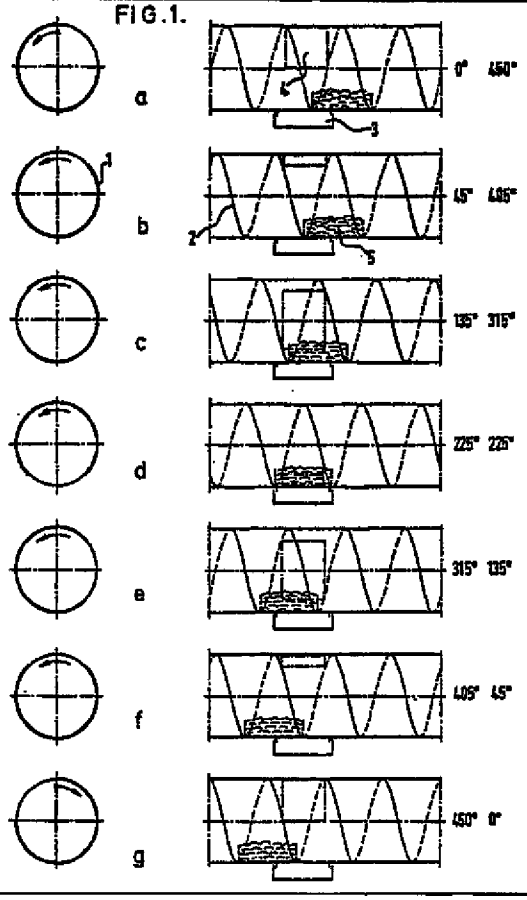
(54) Batch laundry washing machine

(57) A batch washing machine comprises a tubular washing drum 1 with a helically coiled internal wall 2. A heating chamber 3 surrounds one region of the washing drum and is connected thereto for passage of liquid by means of a through-flow aperture 4 in said washing drum between the heating chamber and the interior of the drum at said region. During washing, the drum is reciprocated about its axis and the aperture 4 is so disposed on the drum that it occupies its lowest position in the middle of the reciprocatory stroke of the drum. The aperture 4 may be constructed as a multiple perforation zone or screen. A second interior screen 6 may extend parallel to the drum circumference but over a larger area than the aperture 4.

FIG.1.



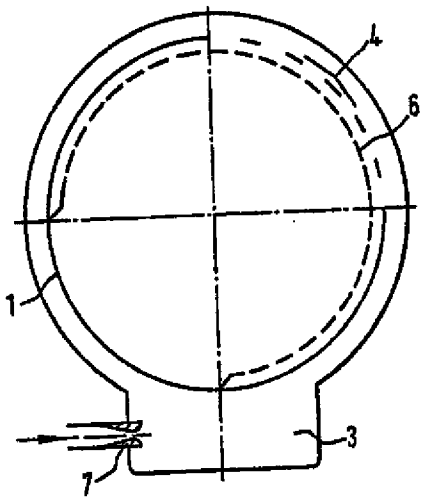


FIG.2.

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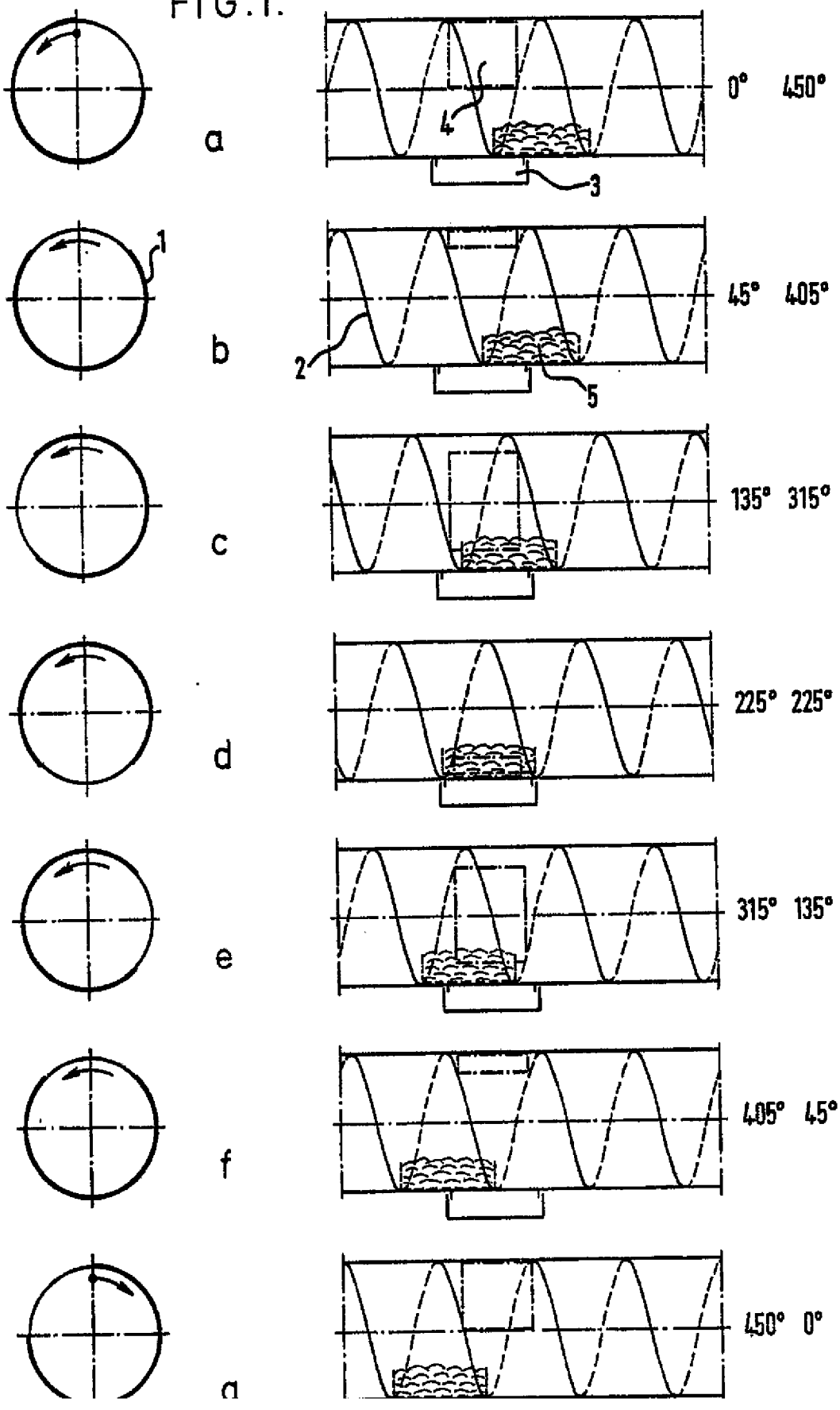
FIG.1.



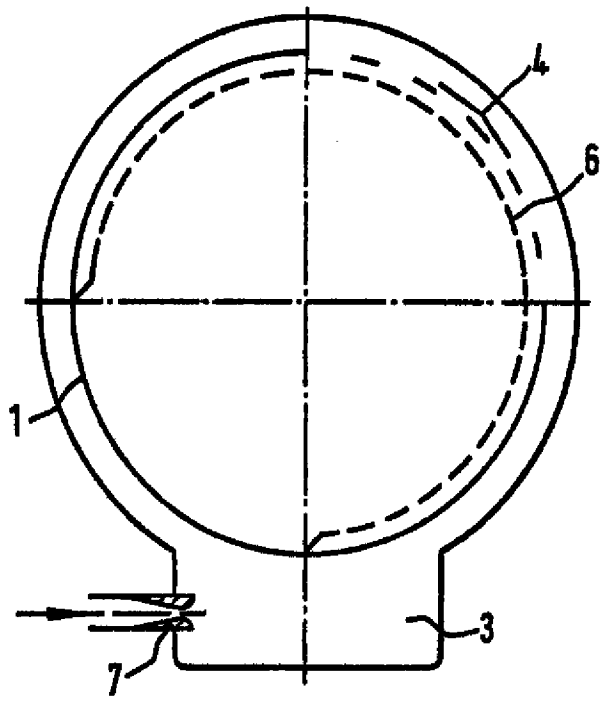


FIG.2.

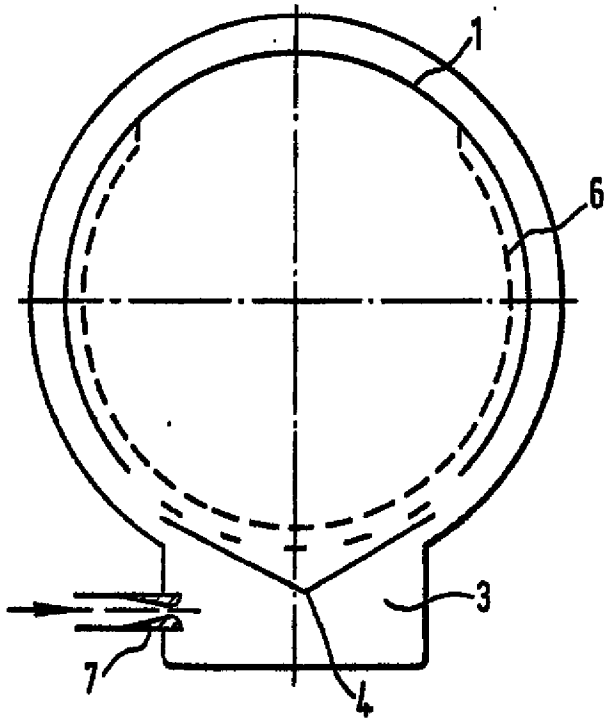


FIG.3

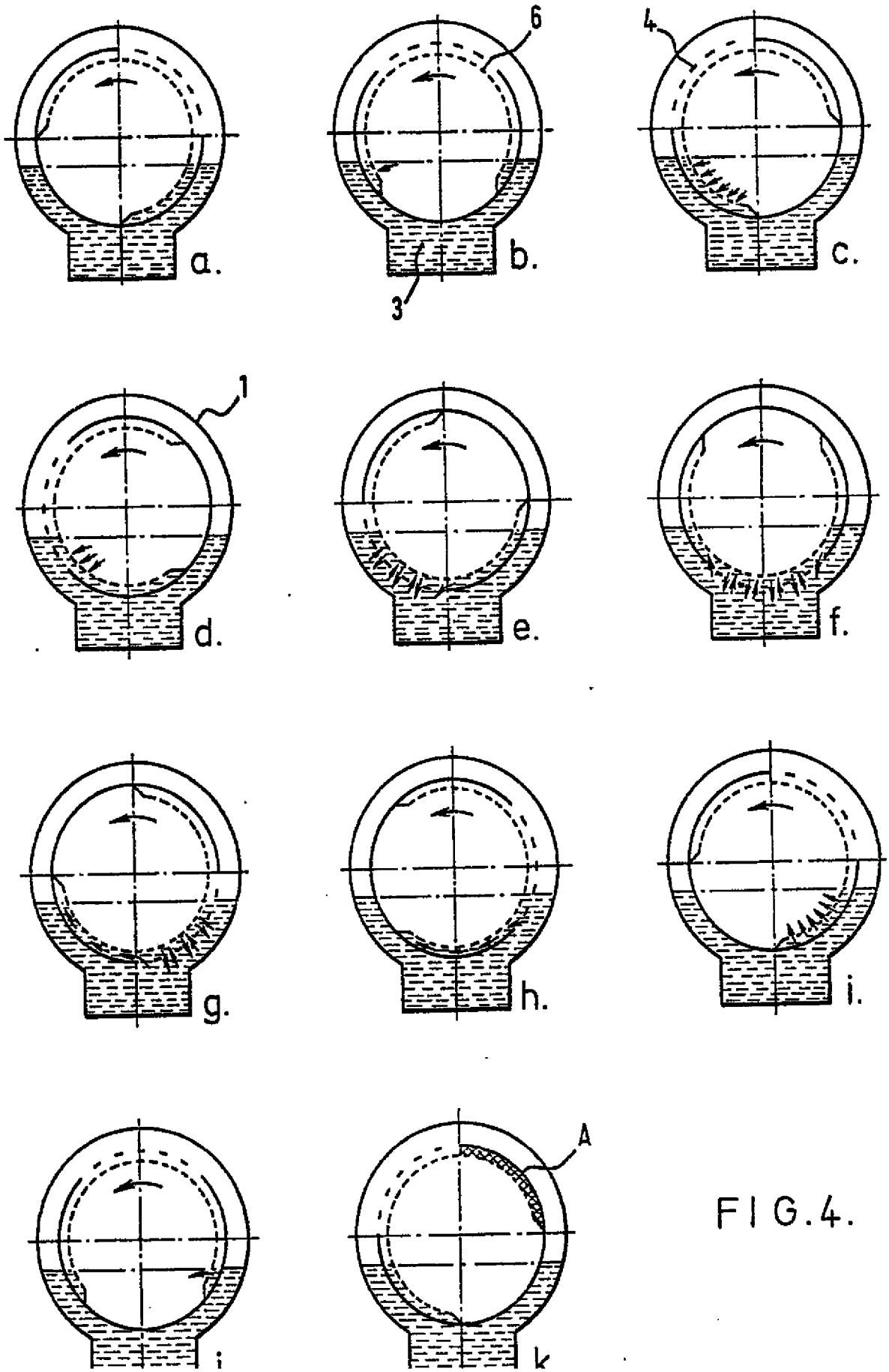


FIG.4.

SPECIFICATION

Batch laundry washing machine

The invention relates to apparatus for the washing of laundry in batches in a tubular washing drum, which contains a helically coiled wall serving to form the washing chambers.

A batch washing machine of this type is known from German Utility Model Specification 1,894,718. The individual laundry batches are introduced at one end of the washing drum and moved in such a manner through the washing drum by means of the relevant programme that they can be taken out properly washed at the other end. Each turn of the helical inner wall which serves as a kind of screw conveyor forms a washing chamber for one batch of laundry in each case. Transport of the batches of laundry through the batch washing machine is effected as the drum rotates in one and the same sense whereas the actual washing operation is carried out by a reciprocating rotary movement of the washing drum of less than 360°. The object of this is to subject the laundry to the most intensive mechanical cleaning movement. Washing temperature and washing agent also influence the washing effect achieved. In the reciprocating movement of the washing drum, about 90° of the rotation have substantially no influence on the mechanical washing effect, since the batch of laundry stays together undisturbed in the water bath. It is only the remaining parts of the rotary movement (up to about 300°) which carry the laundry along on the chamber walls and cause turbulent movement of the articles of laundry. This reduced mechanical washing action has to be compensated for by longer reversing cycles or chemical agents, if good washing results are to be achieved.

British Patent Specification 1,329,593 discloses the introduction of hot washing liquid into a region of the batch washing machine through openings in the washing drum. This drum does not however have a helically coiled wall and most of the transverse walls which are provided are perforated so that water entering the drum through openings in its circumference can flow through the perforations in the transverse walls along the length of the drum. The absence of the helically coiled wall requires some other means to be provided to cause the laundry to pass along the axis of the drum during the washing process.

According to the present invention there is provided a batch washing machine as set out in claim 1 of the claims of this specification.

An example of the invention will now be described with reference to the accompanying drawings which also appear and are described in copending application 8021549 (2053287) from which this application is divided. In the drawings:

Figs. 1a—1g show a series of diagrams of the drum cross-section during one stroke of reciprocating rotary movement through 450°, with the side views corresponding thereto;

Fig. 2 shows a cross-sectional view on a larger scale through the washing drum in the region of the clear washing chamber corresponding to Fig. 1a;

Fig. 3 shows a section corresponding to Fig. 1d; and

Figs. 4a—4k show in a succession of diagrams the water exchange between the heating chamber and the washing drum.

Within the washing drum 1, there is situated the helically coiled wall 2 which acts as a screw conveyor. In the region of the main hot washing zone the washing drum is surrounded by the heating chamber 3. In this chamber, washing water is heated electrically or by means of steam. The heated washing water enters into exchange through the throughflow aperture 4, which is constructed as a multiple perforation area or zone L, with the washing liquor situated in the washing drum, so that the washing water for the hot wash is kept at the desired temperature. Each turn of the wall 2 forms the washing chamber for one laundry batch 5. The washing drum 1 carries out reciprocating rotary movement during the washing operation, each stroke of such movement amounting to approximately 1 revolution plus 90°, that is to say about 450° altogether.

In this way the mechanical washing effect is substantially increased, since the part of the rotary movement beyond 90° has a full effect on the desired movement of the laundry. This will be so evident from the series of diagrams in Figs. 1a to 1g that there is no need for further explanation. For easier understanding, only a single laundry batch 5 has been shown, and this only in the region of the main hot washing zone. In reality the washing drum is considerably longer, and a batch of laundry can be disposed in each of the chambers formed by the coiled wall. When the laundry is to be transported on into the next washing zone after the reciprocating action, the washing drum carries out one full revolution more, before reversing again.

During the washing operation the batch of laundry situated in the clear washing zone is to be heated as intensively as possible. Therefore, the throughflow aperture 4 between heating chamber 3 and washing drum 1 is so arranged over the circumference that at half-stroke of the reciprocating travel it is situated in the lowest position (Fig. 1d, Fig. 3). In this position the water exchange takes place just when the laundry batch for clear washing is in the region of the throughflow aperture 4. This is shown diagrammatically in the sequence of diagrams in Fig. 4.

The washing drum 1 is of double wall construction in the region of the throughflow aperture 4 which is constructed as a multiple perforation zone or screen L (Fig. 1). The second, inwardly projecting, perforated wall or screen 6 extends over a larger region than the throughflow aperture 4, and is intended to allow satisfactory flow of the water as indicated by the arrows. In the heating chamber 3, which surrounds the washing drum 1 in the region of the clear washing zone.

the washing water situated in chamber is heated by the introduction of steam through the nozzle 7. Whilst the throughflow aperture 4 is in the lowest position (Fig. 4f) the most intensive exchange takes place between the heated water of the heating chamber and the cooler water of the washing drum. However, this exchange begins already in phase Fig. 4d and ends in the phase shown in Fig. 4h. In the Fig. 4f phase, half of the reverse rotation of 450° has just been reached. In this way, water exchange during a clear washing phase always takes place only in the region of the same laundry batch. While this laundry batch, owing to the rotation of the washing drum past 360° and due to the worm-like shape of the wall 2, is shifted sideways beyond the region of the heating chamber, exchange of water does not occur.

The cross-hatched area A in Fig. 4k indicates the exchange volume which is brought into effect forcibly.

CLAIMS

1. A batch washing machine comprising a tubular washing drum containing a helically coiled wall, means to reciprocate the drum about its axis and a heating chamber which surrounds one region of the washing drum and is connected thereto for passage of liquid by means of a throughflow aperture in said washing drum between the heating chamber and the interior of the drum at said region, this aperture being so disposed on the washing drum circumference that it occupies its lowest position at approximately half-way through the reciprocating stroke of the washing drum.

2. A washing machine as claimed in claim 1, wherein the washing drum comprises an interior screen extending parallel to the circumference of the drum across the aperture and over a larger area than the aperture.

3. A batch washing machine substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

New claims or amendments to claims filed on 7 March 1983.

Superseded claims 1 and 2.

New or amended claims:

1. A batch washing machine comprising a tubular washing drum containing a helically coiled wall, means to reciprocate the drum about its axis and a heating chamber which surrounds one region of the washing drum and is connected thereto for passage of liquid by means of a throughflow aperture zone in said washing drum between the heating chamber and the interior of the drum at said region, this aperture zone being so disposed on the washing drum circumference that it occupies its lowest position half-way through the reciprocating stroke of the washing drum.

2. A washing machine as claimed in claim 1, wherein the washing drum comprises an interior screen extending parallel to the circumference of the drum across the aperture zone and over a larger area than the aperture zone.

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